Service Manual T51

Issue 1.0

DiVA T51
AM/FM Tuner



ARCAM

Contents List

T51 Tuner Circuit Description

Power Supply

Mains voltage selection is made by placing a fuse, of appropriate value, in the 115V or 230V position.
The single secondary is rectified and regulated and supplies four regulators.

Z7 is always powered when the mains is connected and keeps the preset memory of the micro controller intact.
The high-value capacitor (C84) will keep this data safe, for a limited time, in case of mains power failure.

Z5 provides the main 12V supply rail for the RF and audio circuits. This is always connected, except for the supply to the FM front end, which is disabled by Q2 when the unit is turned 'off'.

Z4 powers the LED back light on the display PCB.

Z6 is the 5V digital supply for the micro controller.

FM Tuner & IF

The FM aerial input is mixed in the front end FE1 which provides a 10.7MHz IF output. This is filtered and amplified by ceramic filters CF1 & CF2 and the circuit based around Q9 & Q10. A third filter CF3 can be put in circuit by fitting jumpers JP1 & JP2 across pins 2 & 4 and 1 & 3 of SK6 respectively. This effectively narrows the IF band to improve selectivity. Transistors Q17 and Q21 are part of the AGC circuit. The position of the jumper link JP7 to either SK10 or SK11 determines from which point the AGC circuit is triggered. The default is for the jumper to be fitted to SK10 which minimizes cross modulation and prevents the IF amp becoming saturated.

The LA1266 (Z9) demodulates the IF at pin 1 into an audio output at pin 12. The quadrature coil is a double-tuned device for best distortion performance.

When a station is tuned correctly the 'On Tune' signal goes low and drives a green LED on the display PCB. This signal is also used by the auto-stop detection and muting circuits.

AM Tuner & IF

The LA1266 (Z9) contains the AM RF amplifier, oscillator and mixer circuitry.

Switching between FM and AM modes is controlled by the 'FM' signal from the micro controller which disables the AM circuitry of Z9 and switches the path of the audio signal through Z8.

MW/LW switching is performed by switching transistors Q12, Q14 & Q15.
Each band has its own oscillator and aerial tuning coils, tuned by a varicap diode all contained within the AM module L5.

The 450kHz IF signal is filtered by coil and ceramic filter combination T5.

Birdie Filter

The ‘ Birdie Filter’ (L2) is a four pole low pass filter, flat to about 53kHz, then with a very steep roll off from then on.. This is designed to reduce co-channel interference in FM Stereo and cut down on irritating ‘ birdie’ noises.

Stereo Decoder

Stereo decoding is performed by LA3401 (Z8). The 38kHz reference signal is accurately created by ceramic resonator X3 and does not require adjustment.
Stereo separation is adjusted for maximum by preset RV1.
This IC also contains FM/AM audio switching and muting functions.

Audio Filters & Output

The left and right channel audio outputs from Z8 are filtered by the de-emphasis network of R1, C1 etc. The correct de-emphasis network is selected by the position of jumpers JP3 & JP4 on the pins of SK8. C2 & C102 (220pF) are selected for 50us and C3 & C103 (560pF) for 75us de-emphasis.

The final filter, based on Z3, is a two-pole low-pass circuit with a cut-off frequency of around 20kHz. Also included is a 19kHz notch filter, L1 & C4, that removes most of the residual pilot tone.

Muting

When the power switch is turned off Q5 is switched off, enabling the mute circuitry of the stereo decoder (Z8) via diode D9. This removes the need for output muting transistors and eliminates switching clicks and pops.
At switch-on the mute is enabled while C21 is charged via Z8.

In normal use the mute inside Z8 is enabled in three other ways:

The AMUTE signal from the micro controller is active at power-on and for a short time when a preset is changed.
When the band is changed the output is muted by charging C52.
The audio output must be muted whenever the tuner is in stereo mode and is also off-tune. This is to eliminate noise during tuning and is provided by Q8 and the MONO and OFF TUNE control signals.
In Mono mode this mute is disabled so that weak stations can be heard, despite the noise.

Micro controller

Control of the DiVA T51 tuner is performed by a single micro controller Z10, LA7230. This also provides keypad input and drives a LCD directly.

At power-on a matrix of diodes is scanned to set-up the controller for the correct options:

D7 selects the correct frequency ranges.

D10 enables the use of Auto tuning as well as manual tuning.

D8 allows the Auto-tuning mode to use the ‘ IF Count’ method of searching.

The position of jumpers JP 5 & JP6 fitted to SK9 are used to disable or enable LW and also whether the AM band steps are 9 kHz (UK) or 10 kHz (USA).

Z10 provides control signal outputs for the following functions:

MONO - To defeat the stereo decoder

AMUTE - Turns on the mute circuit when a button is pressed & during tuning.

FM, MW & LW - Only one output active low at any one time. Used to switch on specific parts of the RF circuitry as appropriate.

The micro controller includes a Phase-Locked-Loop (PLL) circuit which compares the tuner local oscillator signals (FMIN & AMIN) with a reference frequency. Based on this information and the required tuned frequency the controller varies the tuning voltage to the FM and AM front ends.

The tuning voltages (FMVt & AMVt) have to be filtered from the PLL by the circuitry around Q7 & Q13.

Display PCB

The display PCB holds the keypad, LCD display, LED back light module and On-Tune indicator.

The remote control receiver consists of the receiver RX1 and the PIC micro controller, Z1, which is used to decode the incoming remote control codes from RC5 format to Sanyo type commands. This is because the Sanyo micro controller, Z10, can only respond to Sanyo remote control commands.

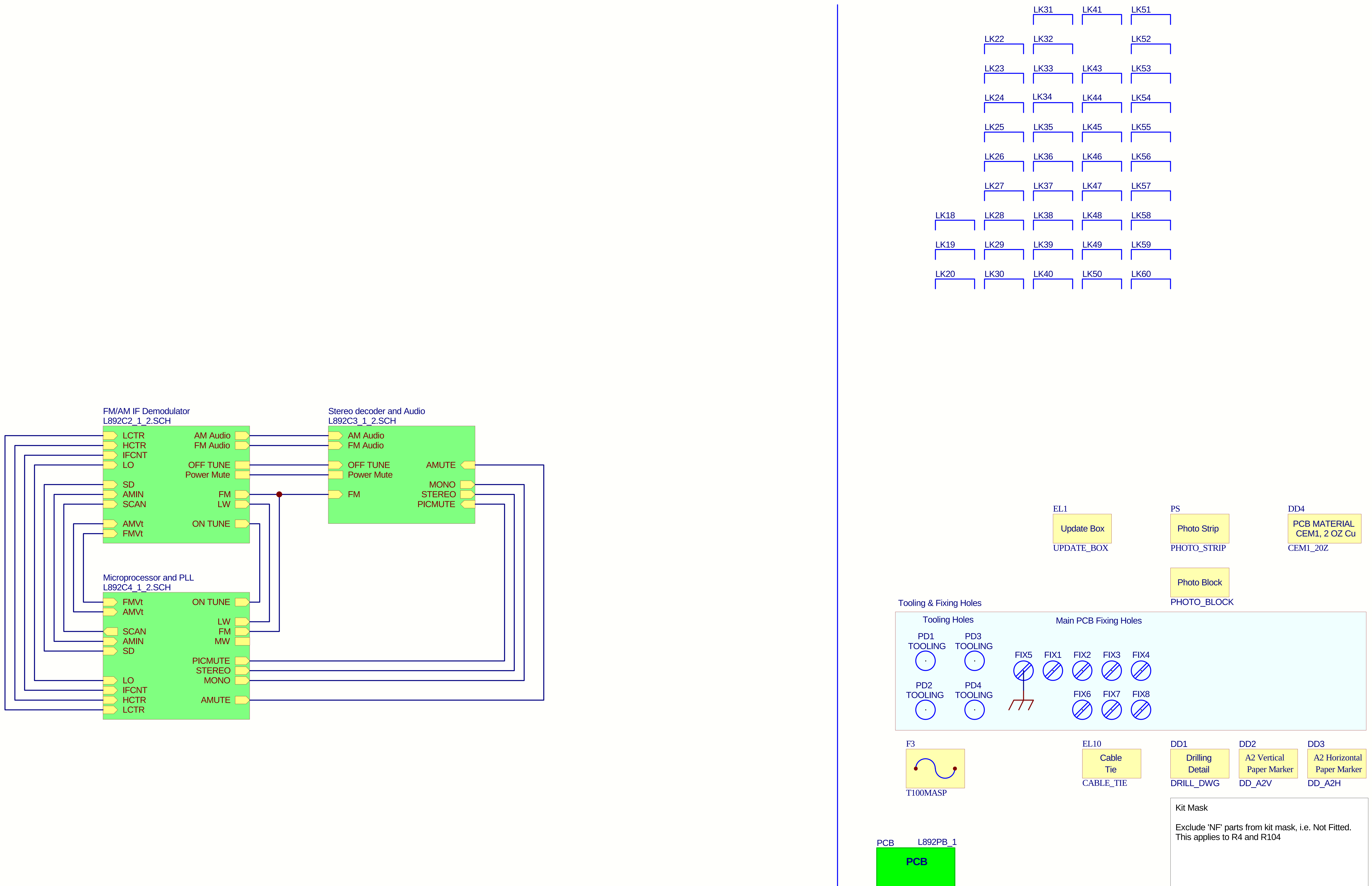
Jumper Settings

Jumper	Option 1	Option 2
JP1	Best sensitivity	Best sound
JP2	Best sensitivity	Best sound
JP3	De-emphasis 50uS	De-emphasis 75uS
JP4	De-emphasis 50uS	De-emphasis 75uS
JP5	LW & MW	MW only
JP6	AM spacing 9KHz	AM spacing 10KHz
JP7	Less X-MOD	Less De-sense

USA / Rest of the World

If the T51 is transferred from or to the USA the following jumper settings will require changing.

Jumper	Rest of the World	USA	Action
JP3	50uS	75uS	De-emphasis
JP4	50uS	75uS	De-emphasis
JP6	9KHz	10KHz	AM spacing



Kit Mask

Exclude 'NF' parts from kit mask, i.e. Not Fitted.
This applies to R4 and R104

DRAWING TITLE
T51 Tuner

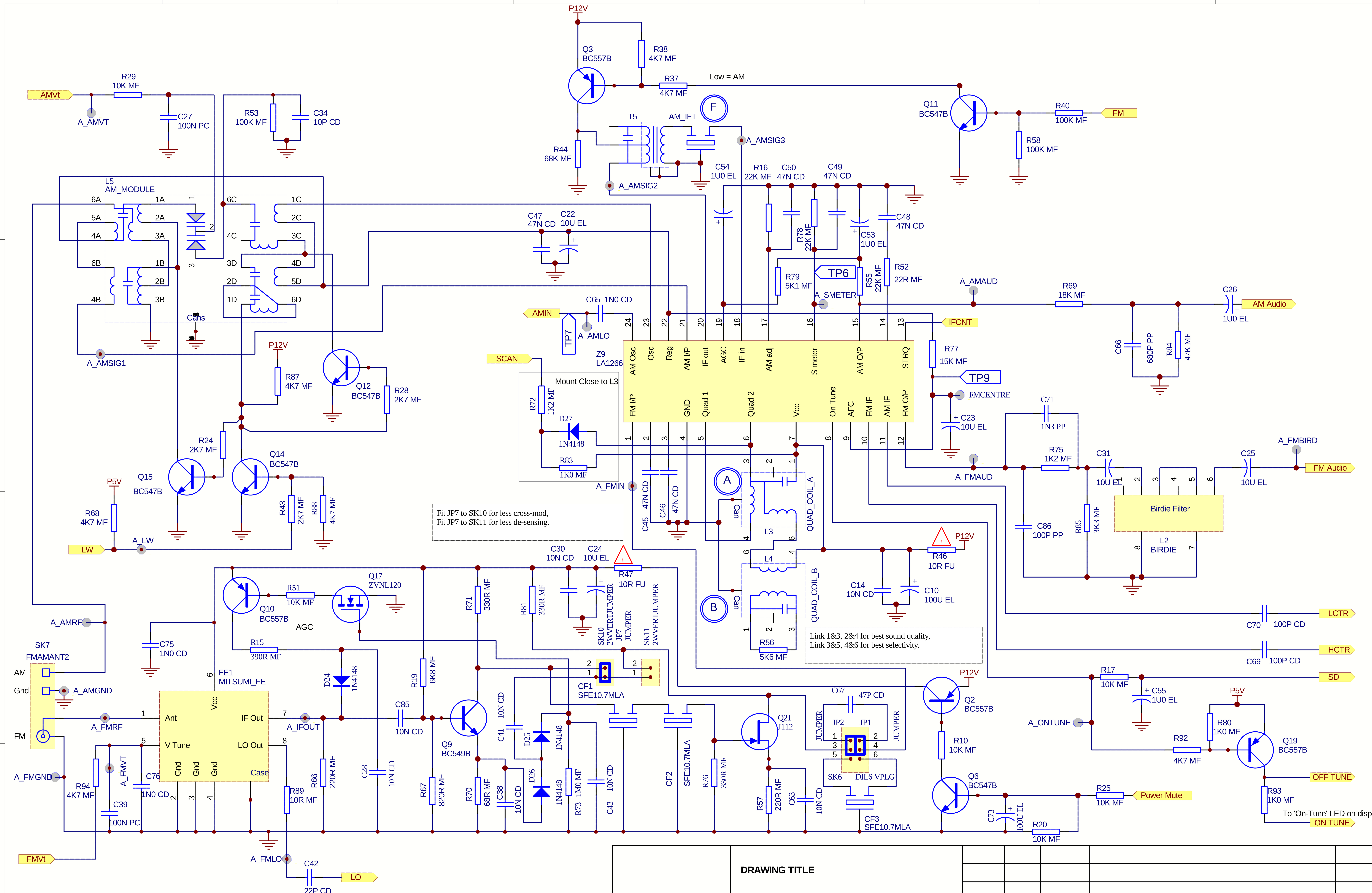
Circuit Diagram

A & R Cambridge Ltd.
Pembroke Avenue
Denny Industrial Centre
Waterbeach
Cambridge CB5 9PB

Notes:

ECO No.	INITIALS	DATE	DESCRIPTION OF CHANGE	ISSUE
00_1078	CL	12/09/00	R93 WAS 220R NOW 1K0	1.2
00-1044	CL	17/7/00	PRODUCTION RELEASE	1

Filename: G:\DATA\ECO\ECO AGENDA\00_1078 L892 T51 TUNER\L892_1\L892_1.ddb - L892c1_1_2.prj
Date Printed: 12-Sep-2000
Drawn by: CL
Sheet 1 of 4
DRAWING NO. L892CT



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Pembroke Avenue
Denny Industrial Centre
Waterbeach
Cambridge CB5 9PB

DRAWING TITLE

T51 Tuner

Circuit Diagram

ECO No.	INITIALS	DATE	DESCRIPTION OF CHANGE	ISSUE
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00_1044	MGM	31/7/00	INITIAL RELEASE	1

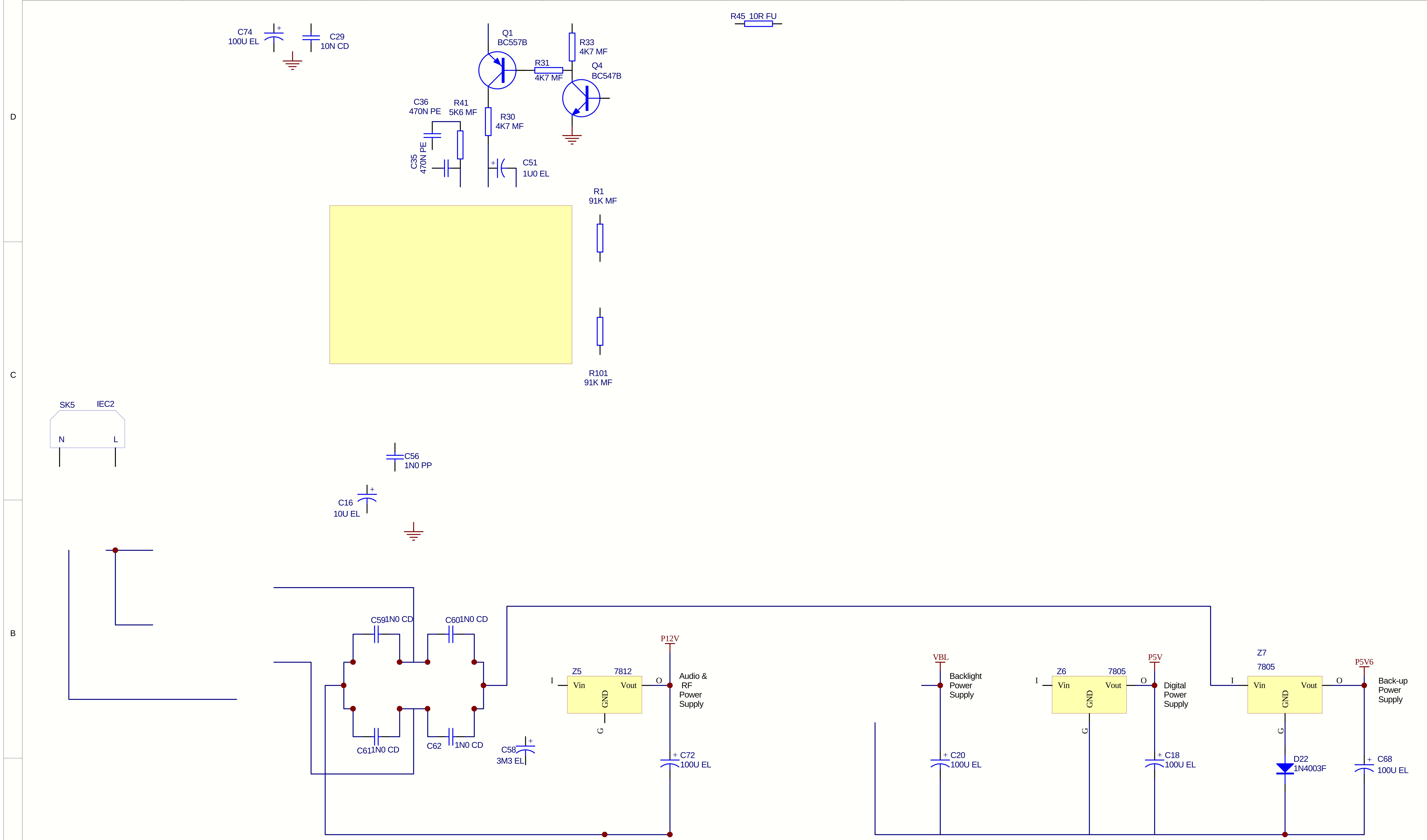
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Date Printed 13-Sep-2000

Drawn by: CAH/SJB

Sheet 2 of 4

DRAWING NO. L892CT



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DRAWING TITLE

T51Tuner

Circuit Diagram

ECO No.	INITIALS	DATE	DESCRIPTION OF CHANGE	ISSUE

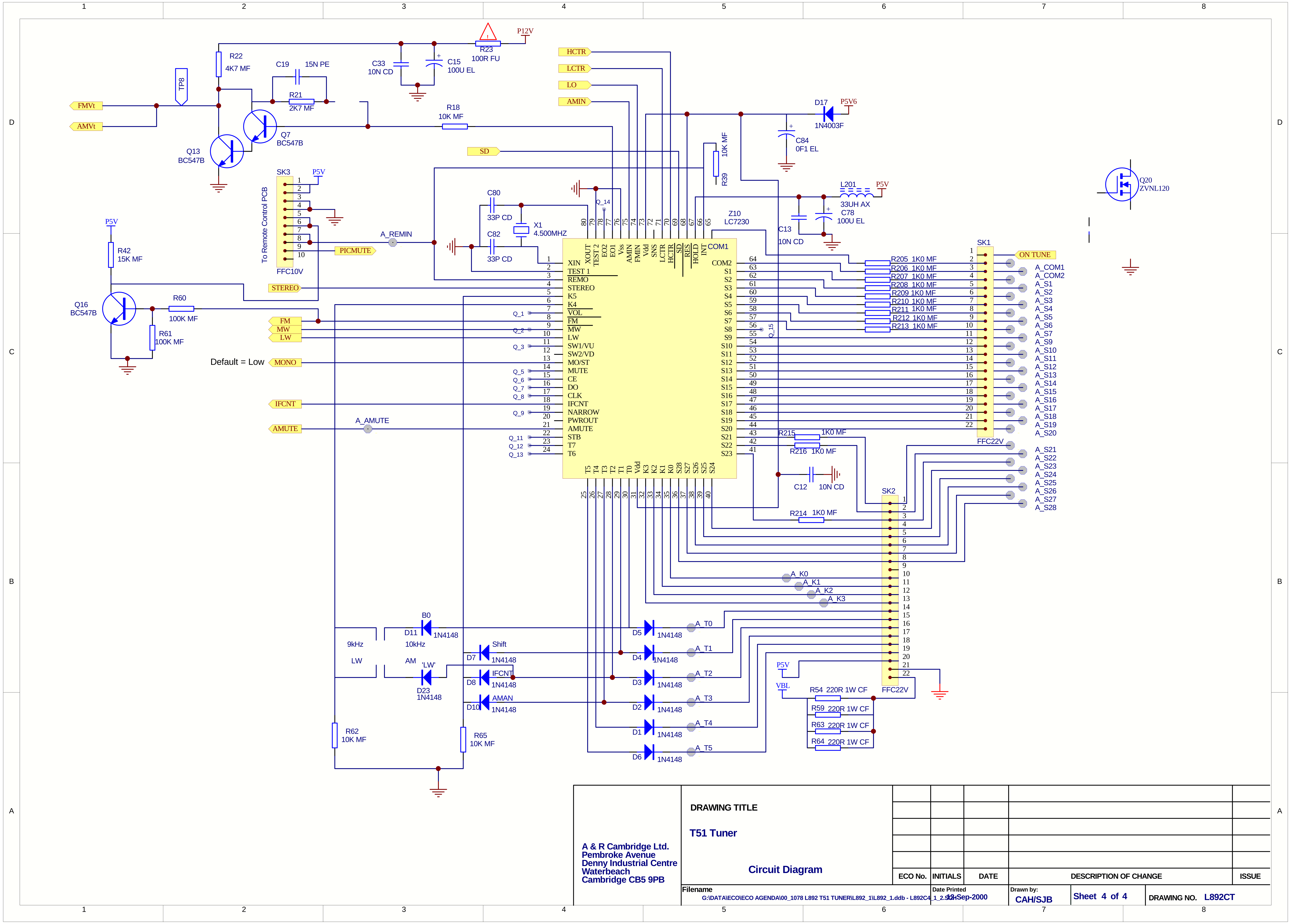
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Date Printed 13-Sep-2000

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Sheet 3 of 4

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DRAWING TITLE

T51 Tuner

Circuit Diagram

ECO No.	INITIALS	DATE	DESCRIPTION OF CHANGE	ISSUE

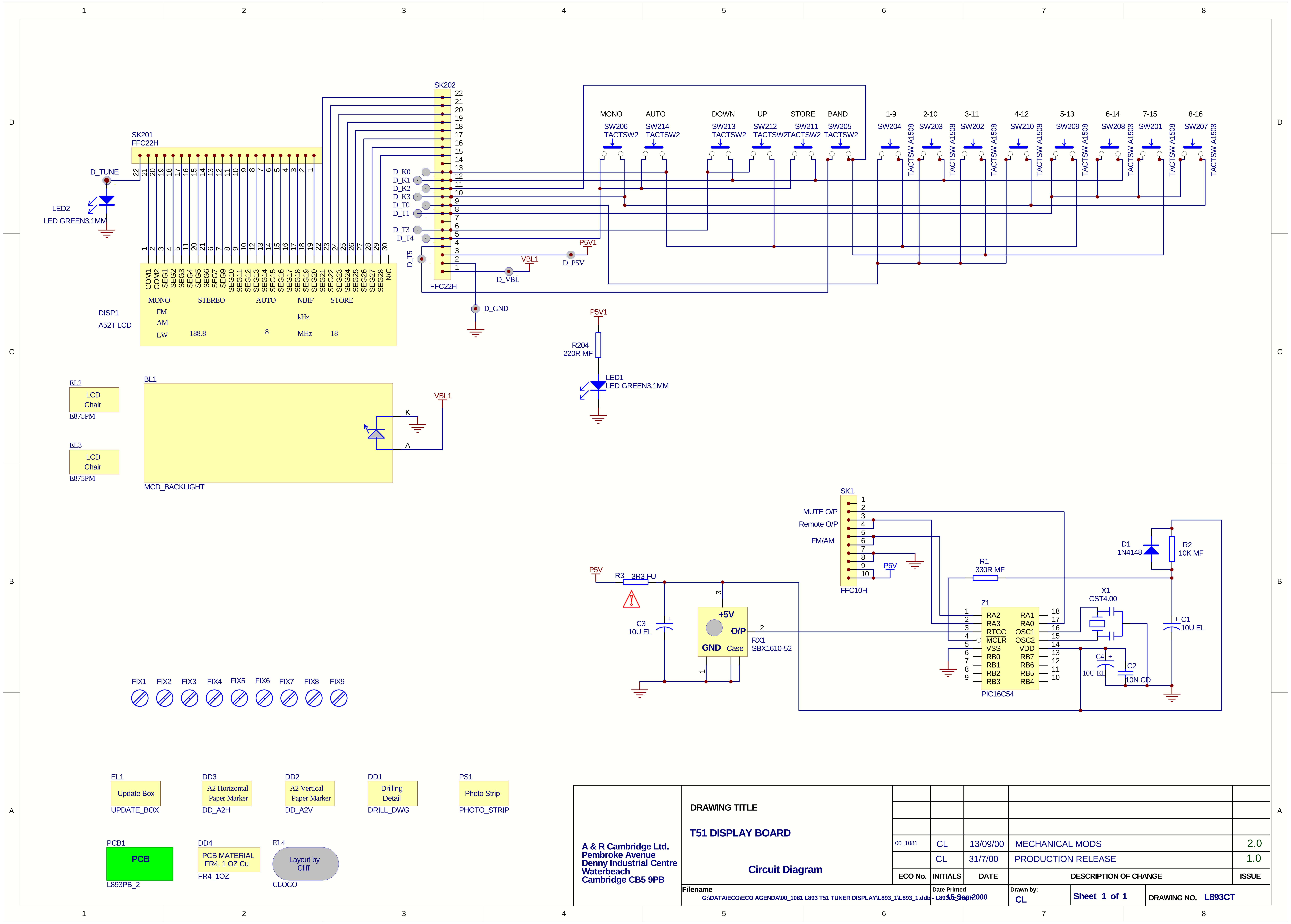
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Date Printed 12-Sep-2000


Drawn by: CAH/SJB

Sheet 4 of 4

DRAWING NO. L892CT



SK202
FFC22H
SK201
FFC22H
D_TUNE
LED2
LED GREEN3.1MM
DISP1
A52T LCD
COM1 COM2 SEG1 SEG2 SEG3 SEG4 SEG5 SEG6 SEG7 SEG8 SEG9 SEG10 SEG11 SEG12 SEG13 SEG14 SEG15 SEG16 SEG17 SEG18 SEG19 SEG20 SEG21 SEG22 SEG23 SEG24 SEG25 SEG26 SEG27 SEG28 N/C
MONO STEREO AUTO NBIF STORE
FM AM LW
kHz MHz
188.8
D_K0 D_K1 D_K2 D_K3 D_T0 D_T1 D_T3 D_T4 D_T5
P5V1
VBL1
D_VBL
D_P5V
D_GND
MONO AUTO DOWN UP STORE BAND
SW206 TACTSW2
SW214 TACTSW2
SW213 TACTSW2
SW212 TACTSW2
SW211 TACTSW2
SW205 TACTSW2
1-9 2-10 3-11 4-12 5-13 6-14 7-15 8-16
SW204 SW203 SW202 SW210 SW209 SW208 SW201 SW207
TACTSW A1508
R204
220R MF
LED1
LED GREEN3.1MM
EL2
LCD Chair
E875PM
EL3
LCD Chair
E875PM
BL1
MCD_BACKLIGHT
K
A
SK1
FFC10H
MUTE O/P
Remote O/P
FM/AM
P5V
R1
330R MF
D1
1N4148
R2
10K MF
X1
CST4.00
Z1
PIC16C54
RA2 RA3 RTCC MCLR VSS RB0 RB1 RB2 RB3
RA1 RA0 OSC1 OSC2 VDD RB7 RB6 RB5 RB4
C1
10U EL
C4
10U EL
C2
10N CD
R3 3R3 FU
C3
10U EL
+5V
O/P
GND
Case
RX1
SBX1610-52
FIX1 FIX2 FIX3 FIX4 FIX5 FIX6 FIX7 FIX8 FIX9
EL1
Update Box
UPDATE_BOX
DD3
A2 Horizontal Paper Marker
DD_A2H
DD2
A2 Vertical Paper Marker
DD_A2V
DD1
Drilling Detail
DRILL_DWG
PS1
Photo Strip
PHOTO_STRIP
PCB1
PCB
L893PB_2
DD4
PCB MATERIAL FR4, 1 OZ Cu
FR4_1OZ
EL4
Layout by Cliff
CLOGO
A & R Cambridge Ltd.
Pembroke Avenue
Denny Industrial Centre
Waterbeach
Cambridge CB5 9PB
DRAWING TITLE
T51 DISPLAY BOARD
Circuit Diagram
00_1081 CL 13/09/00 MECHANICAL MODS 2.0
CL 31/7/00 PRODUCTION RELEASE 1.0
ECO No. INITIALS DATE DESCRIPTION OF CHANGE ISSUE
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Date Printed 15-Sep-2000
Drawn by: CL
Sheet 1 of 1
DRAWING NO. L893CT



L893PB_2.PCB
Top Overlay
13-Sep-2000

R32	RES MF W4 1% 10K	1H310
R33	RES MF W4 1% 4K7	1H247
R34	RES MF W4 1% 47K	1H347
R35	RES MF W4 1% 100K	1H410
R36-R38	RES MF W4 1% 4K7	1H247
R39	RES MF W4 1% 10K	1H310
R40	RES MF W4 1% 100K	1H410
R41	RES MF W4 1% 5K6	1H256
R42	RES MF W4 1% 15K	1H315
R43	RES MF W4 1% 2K7	1H227
R44	RES MF W4 1% 68K	1H368
R45-R47	RES MF FU W3 5% 10R NFR25	1G010
R48	RES MF W4 1% 10K	1H310
R49	RES MF W4 1% 22K	1H322
R50,R51	RES MF W4 1% 10K	1H310
R52	RES MF W4 1% 22R	1H022
R53	RES MF W4 1% 100K	1H410
R54	RES CF 1W 220R 5%	1E122
R55	RES MF W4 1% 22K	1H322
R56	RES MF W4 1% 5K6	1H256
R57	RES MF W4 1% 220R	1H122
R58	RES MF W4 1% 100K	1H410
R59	RES CF 1W 220R 5%	1E122
R60,R61	RES MF W4 1% 100K	1H410
R62	RES MF W4 1% 10K	1H310
R63,R64	RES CF 1W 220R 5%	1E122
R65	RES MF W4 1% 10K	1H310
R66	RES MF W4 1% 220R	1H122
R67	RES MF W4 820R 1%	1H182
R68	RES MF W4 1% 4K7	1H247
R69	RES MF W4 1% 18K	1H318
R70	RES MF W4 68R 1%	1H068
R71	RES MF W4 1% 330R	1H133
R72	RES MF W4 1% 1K2	1H212
R73	RES MF W4 1% 1M0	1H510
R74	RES MF W4 1% 4M7	1H547
R75	RES MF W4 1% 1K2	1H212
R76	RES MF W4 1% 330R	1H133
R77	RES MF W4 1% 15K	1H315
R78	RES MF W4 1% 22K	1H322
R79	RES MF W4 1% 5K1	1H251
R80	RES MF W4 1% 1K0	1H210
R81	RES MF W4 1% 330R	1H133
R82	RES MF W4 1% 330R	1H133
R83	RES MF W4 1% 1K0	1H210
R84	RES MF W4 1% 47K	1H347
R85	RES MF W4 1% 3K3	1H233
R86-R88	RES MF W4 1% 4K7	1H247
R89	RES MF W4 1% 10R	1H010
R91	RES MF W4 1% 10K	1H310
R92	RES MF W4 1% 4K7	1H247
R93	RES MF W4 1% 1K0	1H210
R94	RES MF W4 1% 4K7	1H247
R101	RES MF W4 1% 91K	1H391
R102	RES MF W4 1% 82K	1H382
R103	RES MF W4 1% 12K	1H312
R104	RES MF W4 1% NOT	1H000
R105	RES MF W4 1% 12K	1H312
R106	RES MF W4 1% 4K7	1H247
R107	RES MF W4 1% 10K	1H310
R108	RES MF W4 1% 22K	1H322
R109	RES MF W4 1% 120R	1H112
R205	RES MF W4 1% 1K0	1H210
R206-R216	RES MF W4 1% 1K0	1H210
RV1	PRES 470K LIN HORIZ	6F447
SK1	22-WAY FFC CONN	8K8022
SK2	22-WAY FFC CONN	8K8022
SK3	10-WAY FFC CONN VERT	8K8010
SK4	PHONO SKT 4-WAY EMC	8D224
SK5	IEC MAINS 2-PIN PCB	8A014
SK5	COPPER RIVET TCP/D48 BS	HP007
SK6	6-WAY VERT DIL PIN HEADER	8K6306
SK7	FM/AM PCB COAX & CLIPS	8H116
SK8,SK9	6-WAY VERT DIL PIN HEADER	8K6306
SK10,SK11	2WAY MOLEX VERT MALE CONNECTOR	8K6201
SW1	SW PUSH 4PCO PBT	A1014
T1	ALPHA 5.2 TUNER MAINS TRANSFORMER	L807TX
T2	Mains common mode choke	7E030
T5	FILTER CERAMIC AM IF	7M008
X1	CRYSTAL 4.500MHz PARALLEL	7X017
X3	CER RESON CSB456 456kHz	7W003
Z3	IC OPAMP DUAL NJM2114D	5B2114
Z4,Z5	IC VREG POS 7812	5D7812
Z6,Z7	IC VREG POS 7805	5D7805
Z8	IC RADIO LA3401	5C3401
Z9	IC RADIO LA1266	5C1266
Z10	IC TUNER LC7230	5C7230

T51 Display Board L893_2

Reference	Description	Part Number
BL1	MCD BACKLIGHT	L802ML
C1	ELST 10U 50V	2N610
C2	CERD 10N 100V 20%	2A310
C3	ELST 10U 50V	2N610
C4	ELST 10U 50V	2N610
D1	SSDIODE 1N4148 75V	3A4148
DISP1	ALPHA 5.2 TUNER LCD	E802MC
EL2	LCD chair support	E875PM
EL3	LCD chair support	E875PM
LED1	LED GREEN 3.1MM SLR-37MG3F	3D007
LED2	LED GREEN 3.1MM SLR-37MG3F	3D007
PCB1	PRINTED CIRCIUT BOARD	L893PB_2
R1	RES MF W4 1% 330R	1H133
R2	RES MF W4 1% 10K	1H310
R3	RES MF FU W3 5% 3R3 NFR25	1G833
R204	RES MF W4 1% 220R	1H122
RX1	REMOTE RX SBX1610-52 38KHZ	B2103
SK1	10-WAY FFC CONN HORIZ	8K8110
SK201	22-WAY FFC C ONN HORIZ	8K8122
SK202	22-WAY FFC C ONN HORIZ	8K8122
SW201-204	TACT SWITCH 2-PIN LOW PROF 9.5mm ACTUATOR SKHVPH	A1508
SW205	TACT SWITCH 2-PIN LOW PROF	A1504
SW206	TACT SWITCH 2-PIN LOW PROF	A1504
SW207-210	TACT SWITCH 2-PIN LOW PROF 9.5mm ACTUATOR SKHVPH	A1508
SW211-214	TACT SWITCH 2-PIN LOW PROF	A1504
X1	CER RESON 4.00MHz	7W005
Z1	IC SOCKET 18 PIN 0.3"	8S018
Z1	IC CMOS MICRO PIC16C54XT/P	5H16C54X

T51 General Assembly Parts List

ITEM	230V	115V	100V	SILVER	BLACK	DESCRIPTION	WHERE USED	QTY
A	L813RC					REMOTE CONTROL		1
B	8H014					COAXIAL AREAL ADAPTER		1
C	8H012					FM AERIAL		1
D	8H015					AM AERIAL LOOP		1
1	E907RP					REAR PANEL		1
2	E814SP					SUB PANEL		1
3	E810CH					CHASSIS		1
7				E828CP	E827CP	COVER PLATE		1
9				E971AY	E988AY	FASCIA ASSEMBLY		1
11	5H16C54X					IC CMOS MICRO PIC16C54XT/P + L809SW		1
12	E870PM					MAINS BUTTON		1
13	E879PM					FOOT		4
16	C11106 100mA AS	C11166 160mAS				MAINS FUSE		2
17	F022					FUSEHOLDER COVER		2
18	WT51U 1A					T51 MOTHER PCB ASSEMBLY L892AY		1
19	WT51U 2A					T51 DISPLAY PCB ASSEMBLY L893AY		1
25	L831CA					22-WAY FLEX-FOIL	DISPLAY PCB	2
26	L819CA					10-WAY FLEXFOIL	REMOTE PCB	1
27	H006					SNAP IN SPACER		1
28	K1004					COPPER ADHESIVE TAPE	CUT FROM ROLL	50MM
30	L807TX	L807TX				TRANSFORMER		1
40	HE6V06B					No. 6 x 6mm SCREW		6
41	HF4V09B					No. 4 x 9mm SCREW		17
42	HA3V10A					M3 x 10mm SCREW		7

T51 General Assembly Parts List

ITEM	230V	115V	100V	SILVER	BLACK	DESCRIPTION	WHERE USED	QTY
43				HA4V06S	HA4V06B	M4 X 6mm SCREW		4
44	HA3V06A					M3 x 6mm SCREW		9
49	E82801					FOAM PAD	INSIDE LID ABOVE FLEX CABLE	2
52	F042					CABLE TIE	TRANSFORMER TO PCB	1
55	E806MI					MAINS INSULATOR		1
57	E807BG					DISPLAY WINDOW GASKET		1
58	F163					DAMPING TAPE		.02REEL
59	K5408					LIGHT PIPE SLEEVING (6mm)		1
66	F062					FUSE CLIP		2
69	E879SL					CONFIGURATION LABEL		1
70	E859PM					TUNER TACT SWITCH LENS BUTTON		8
71	HL4AF					RED FIBRE WASHER		2